United States Patent [19]

Madsen

[11] **4,240,489**

[45] **Dec. 23, 1980**

[54] **DRAPERY HANGER AND MANIPULATOR**

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[51] **Int. Cl.**[3] **A47H 1/00**

[52] **U.S. Cl.** **160/126;** 160/330; 160/345

[58] **Field of Search** 160/123–126, 160/330, 345, 346

[56] **References Cited**

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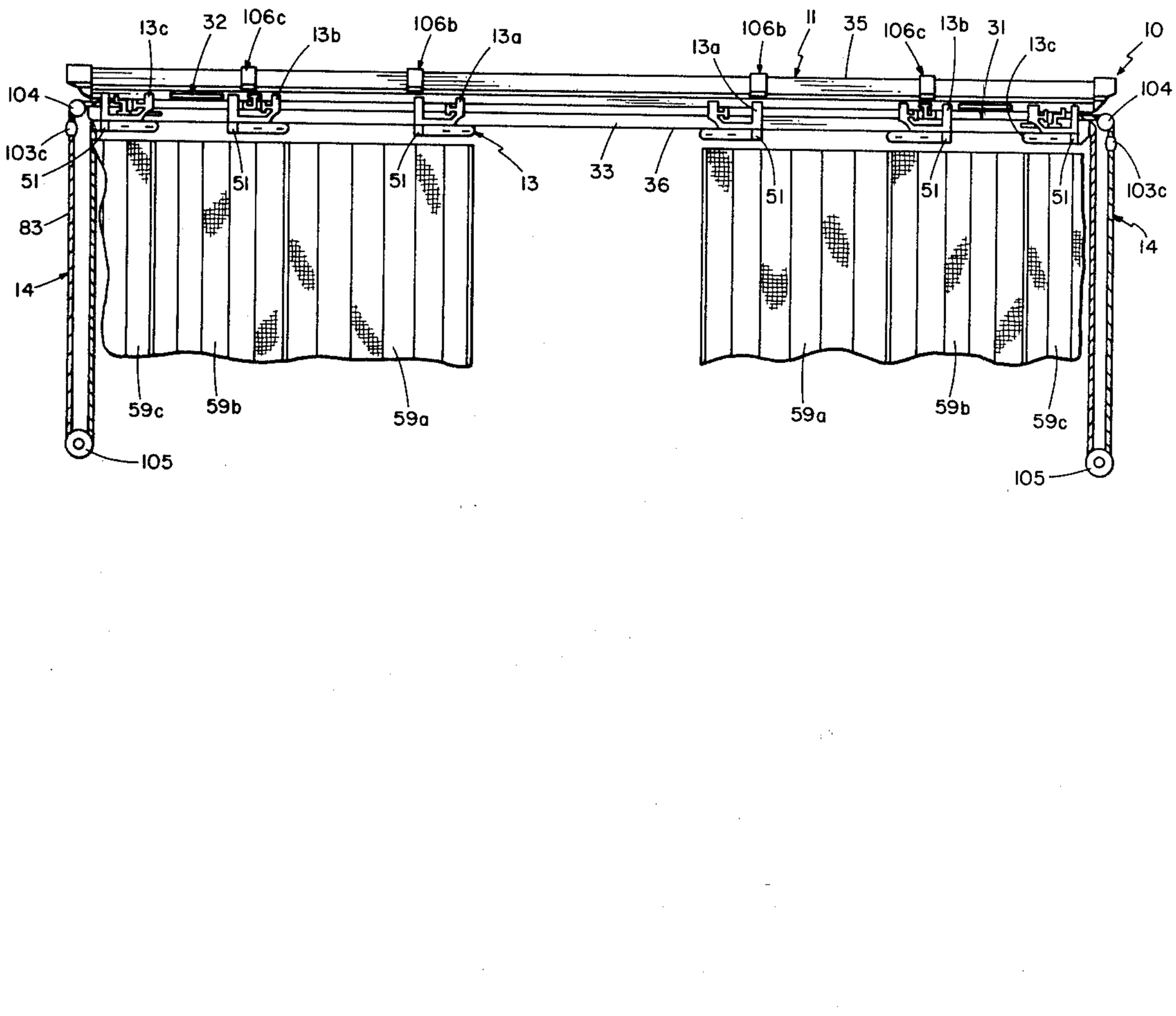
Attorney, Agent, or Firm—Evan D. Roberts

[57] **ABSTRACT**

A drapery hanger and manipulator is disclosed herein having drapery panels or segments suspended on groups of drapery hook hangers and a series of carriers slidably actuatable along a traverse track bridge with inter-working structures and mechanisms driven and operated by a linear drive means for independently moving and positioning the carriers and associated panels or segments.

11 Claims, 24 Drawing Figures



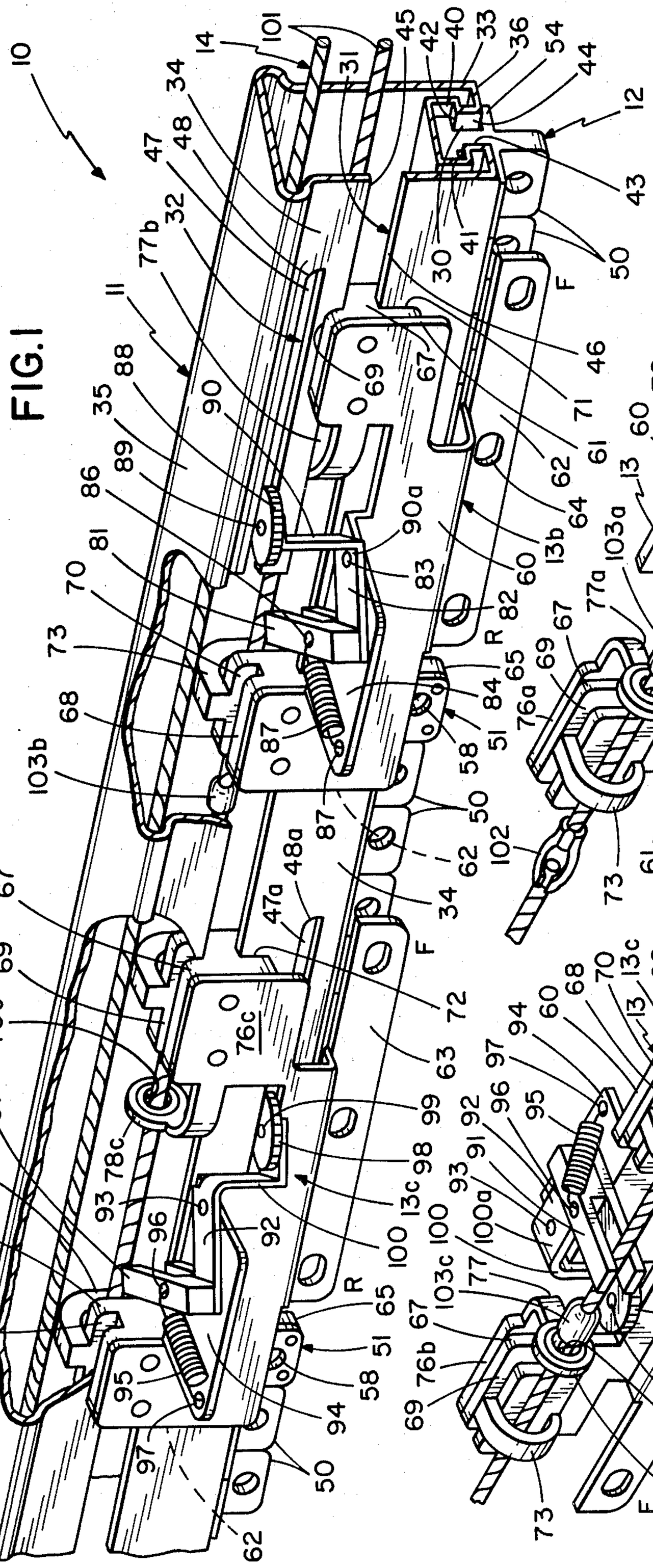


FIG.1

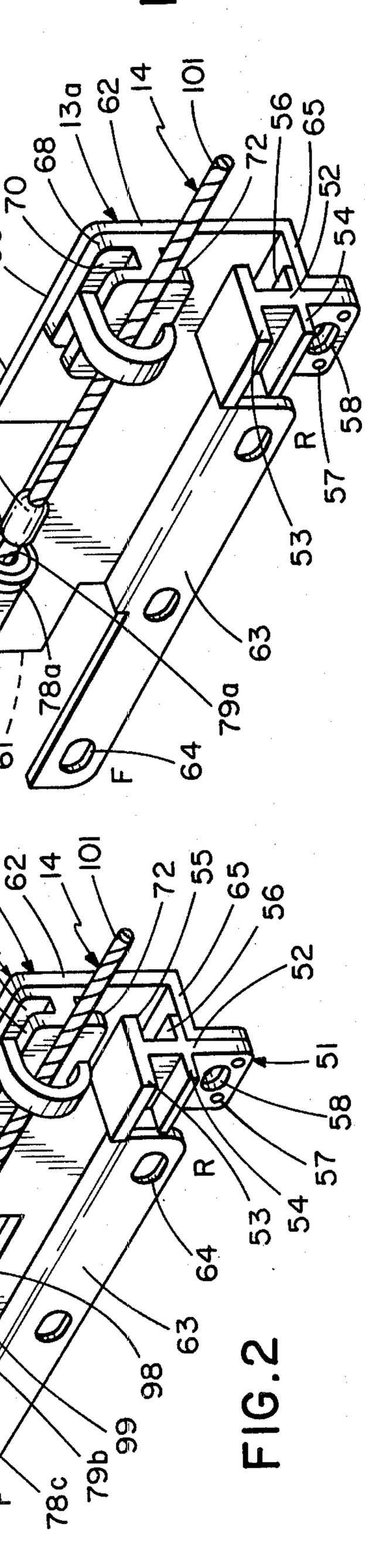


FIG.2

FIG.3

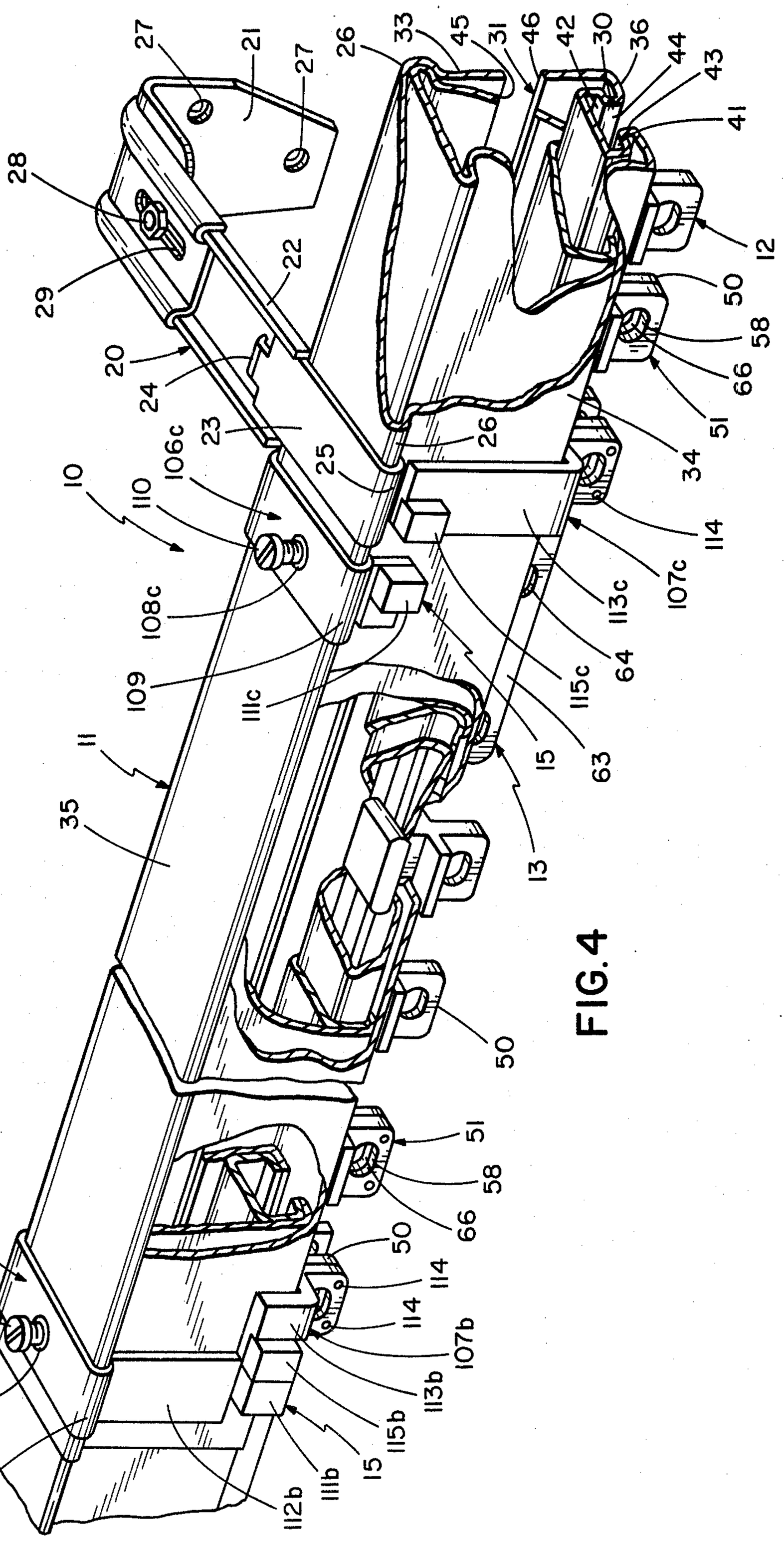

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FIG.4

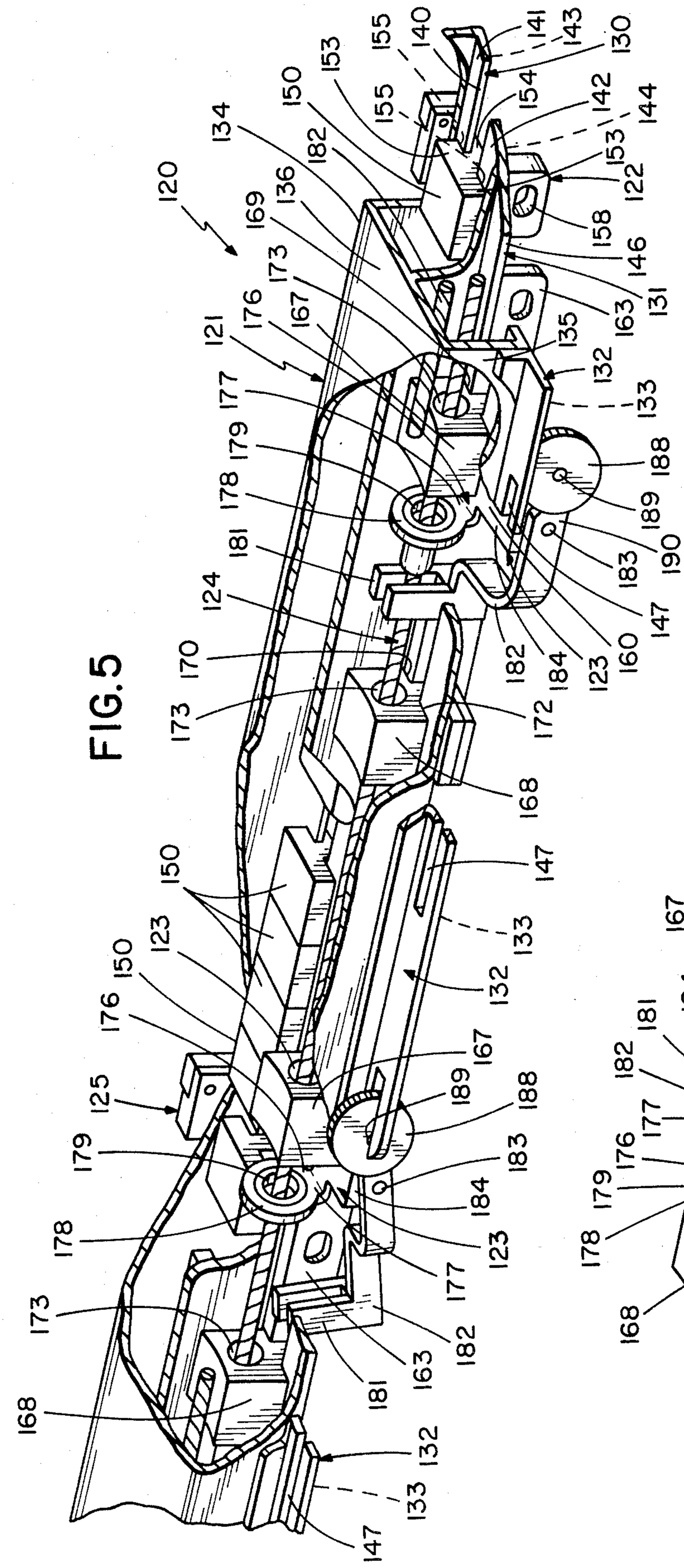

FIG. 5

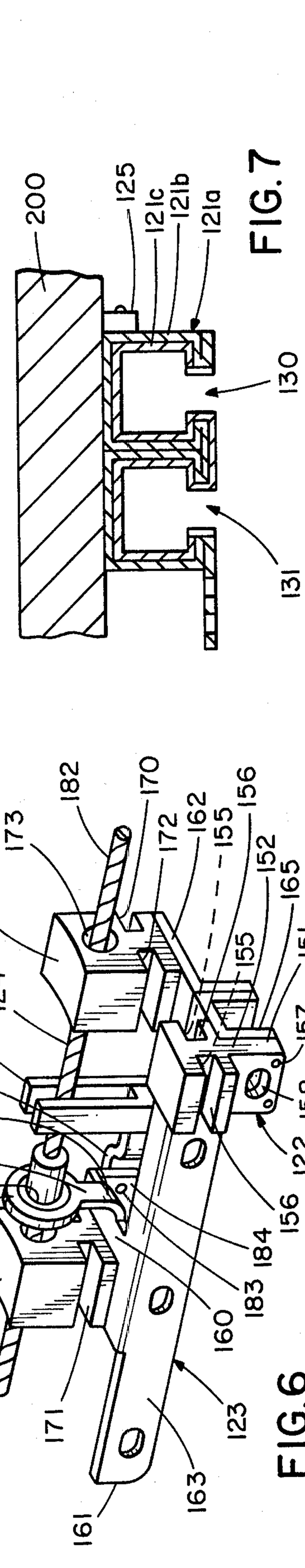

FIG. 7

FIG. 6

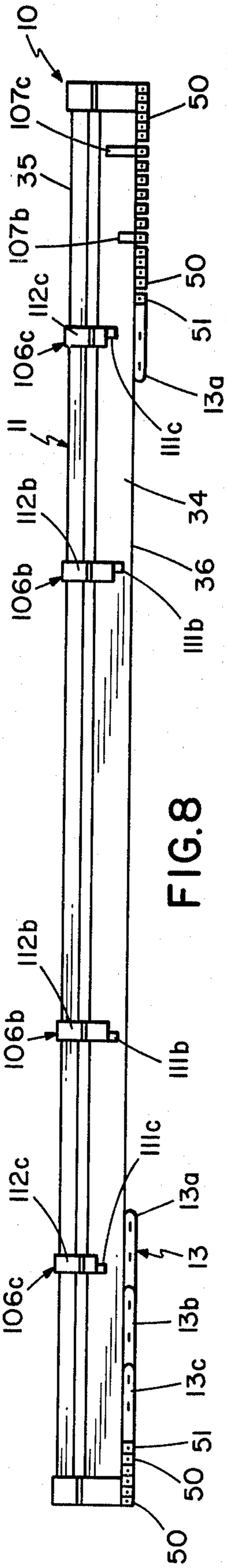

FIG.8

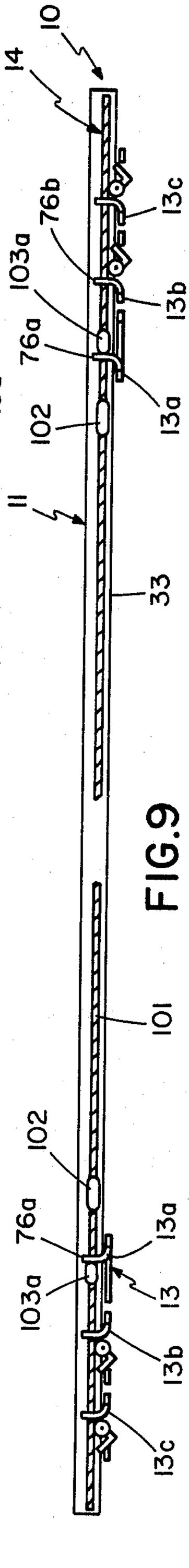

FIG.9

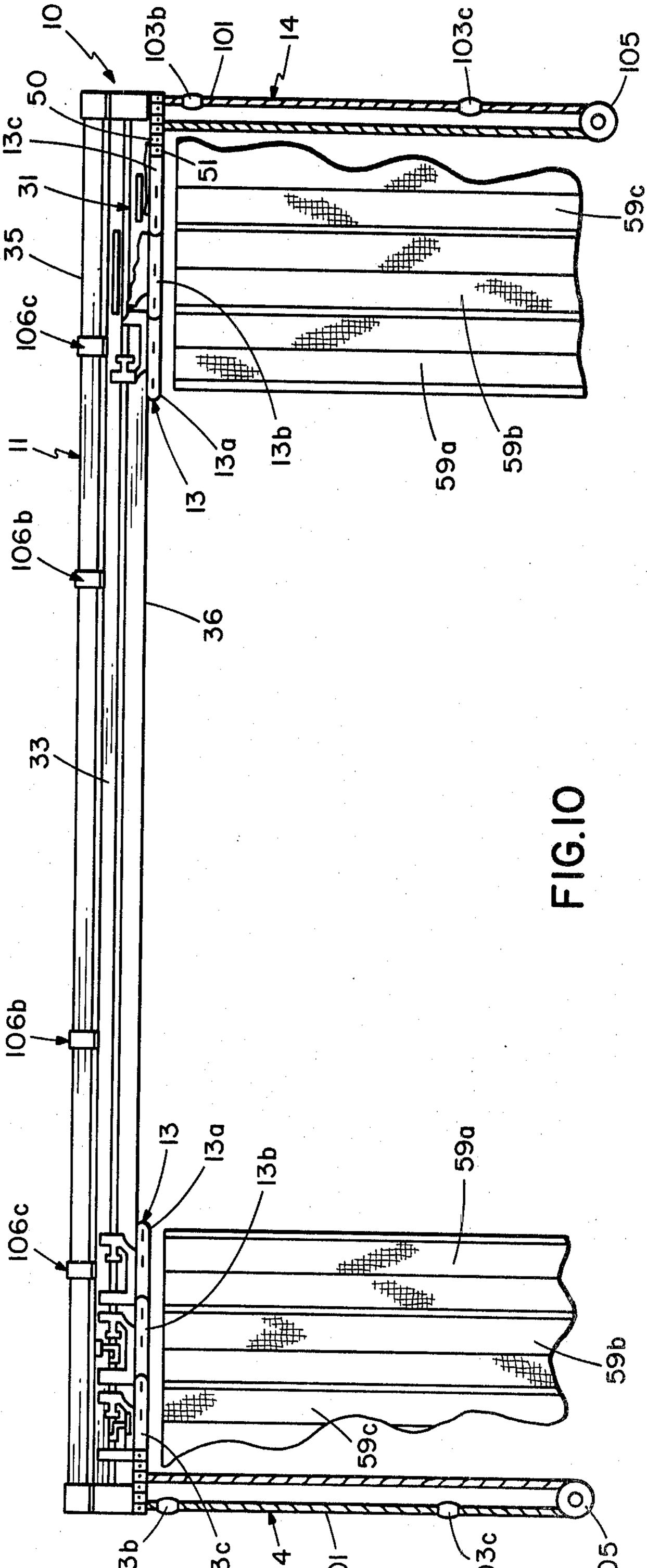

FIG.10

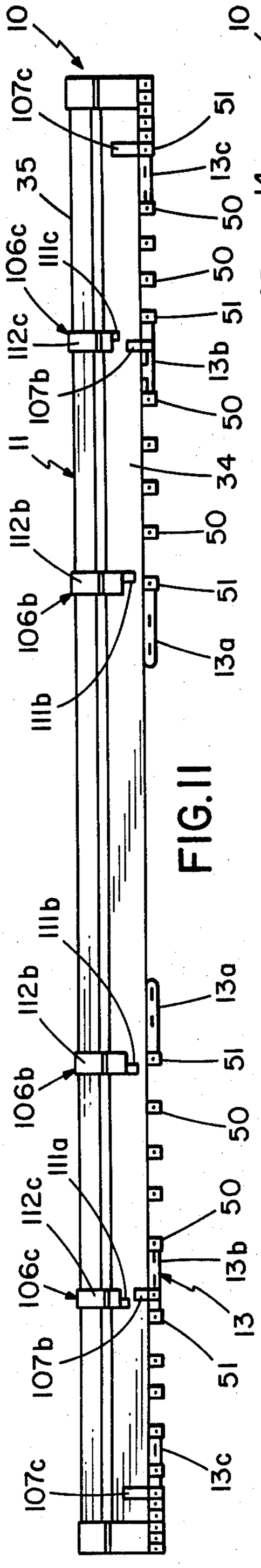

FIG. 11

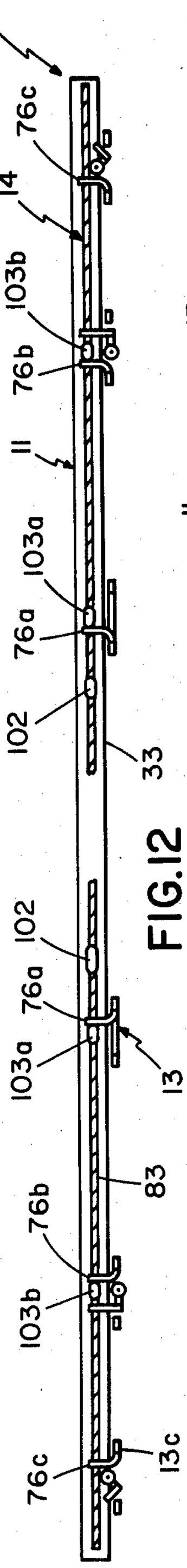

FIG. 12

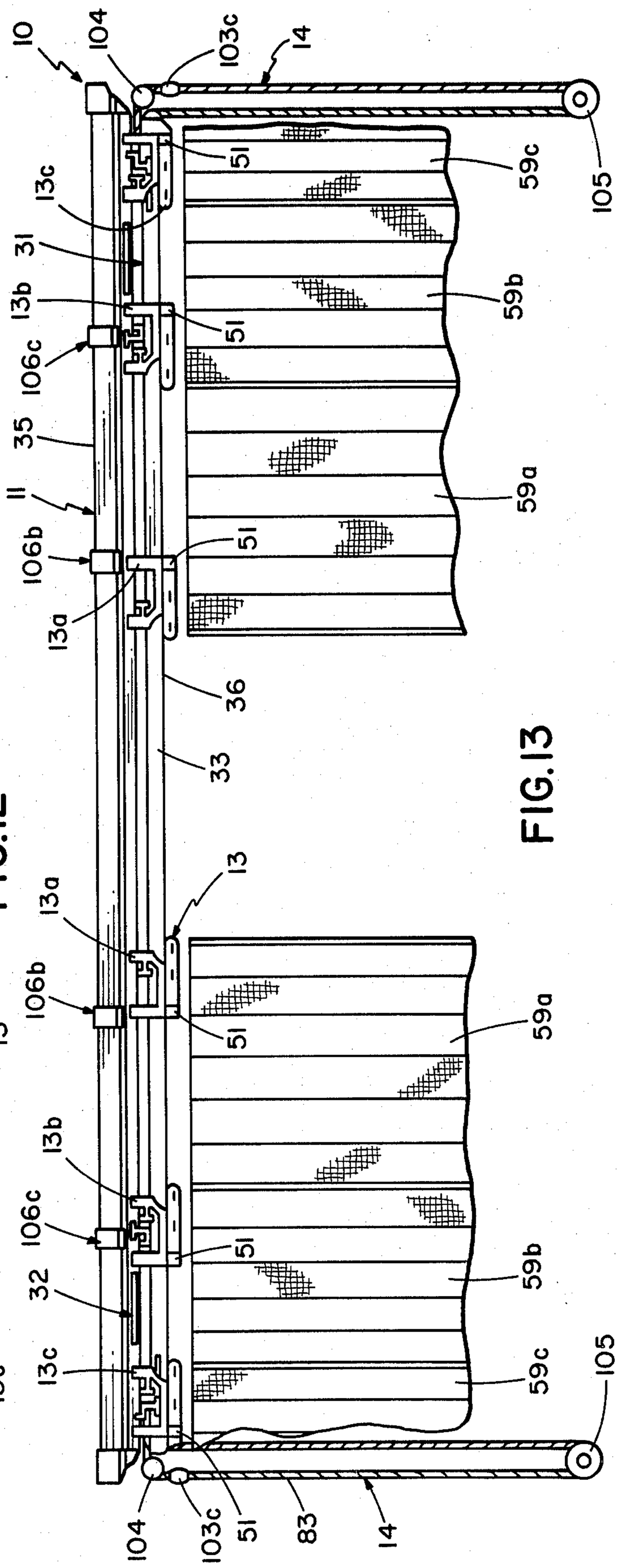

FIG. 13

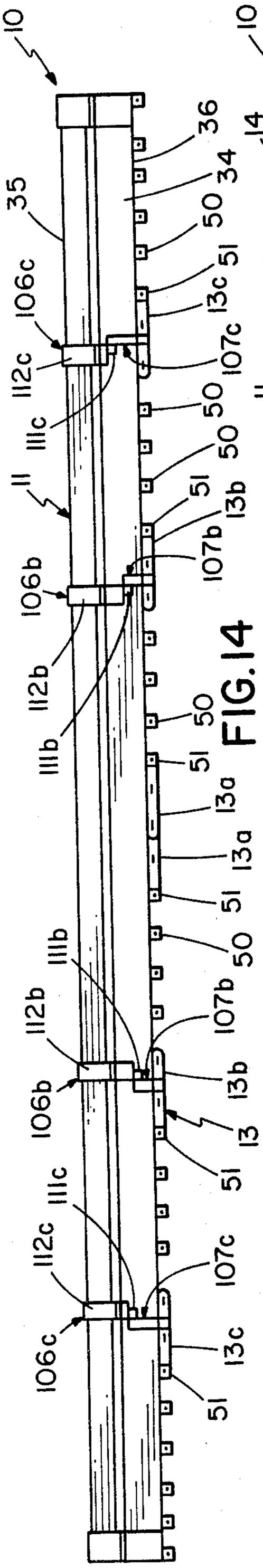

FIG. 14

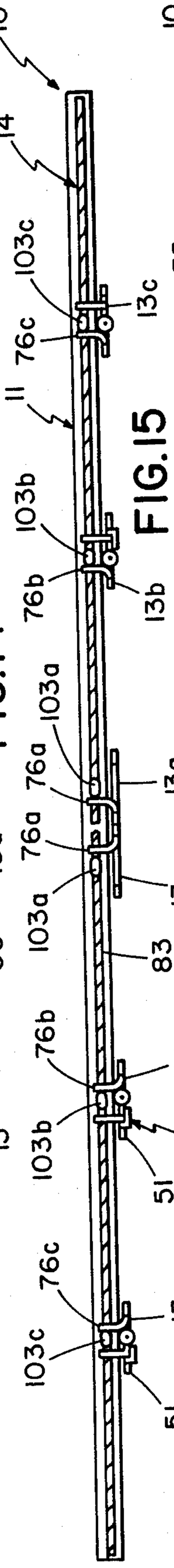

FIG. 15

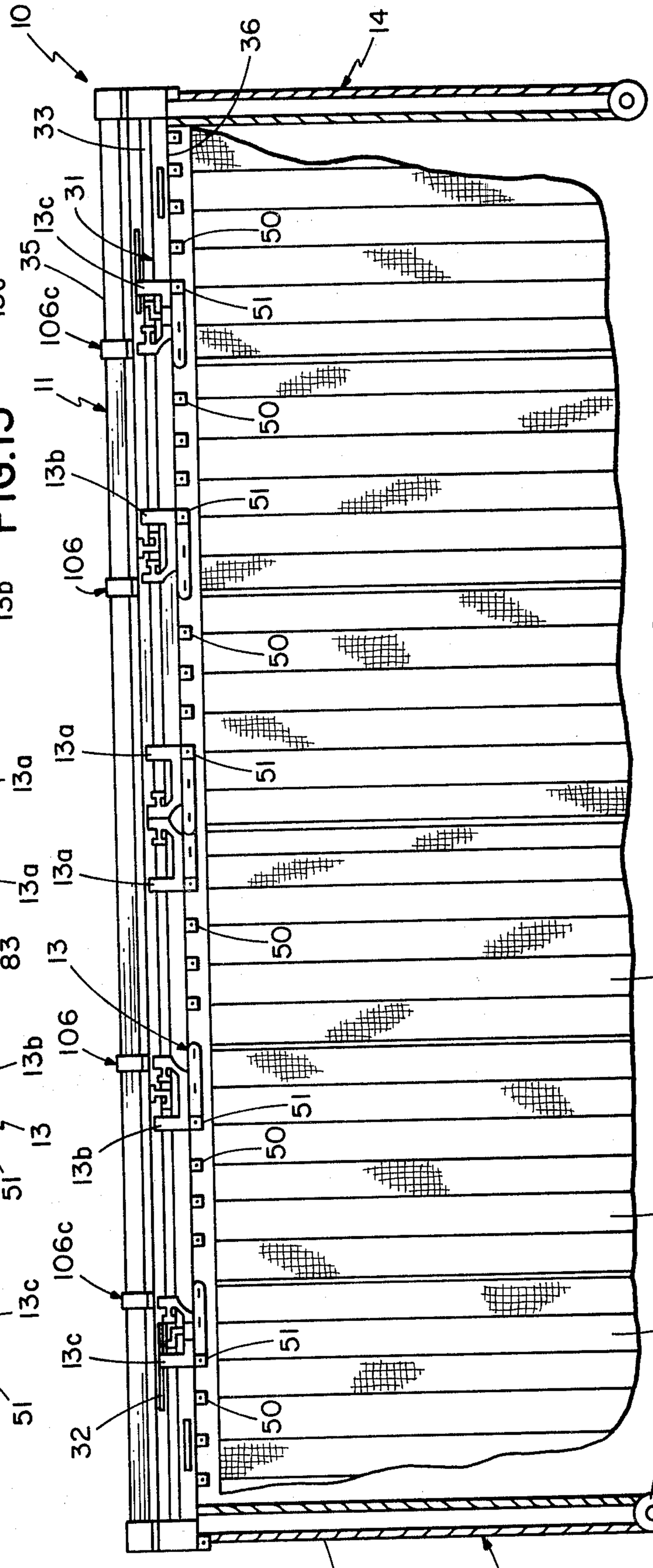

FIG. 16

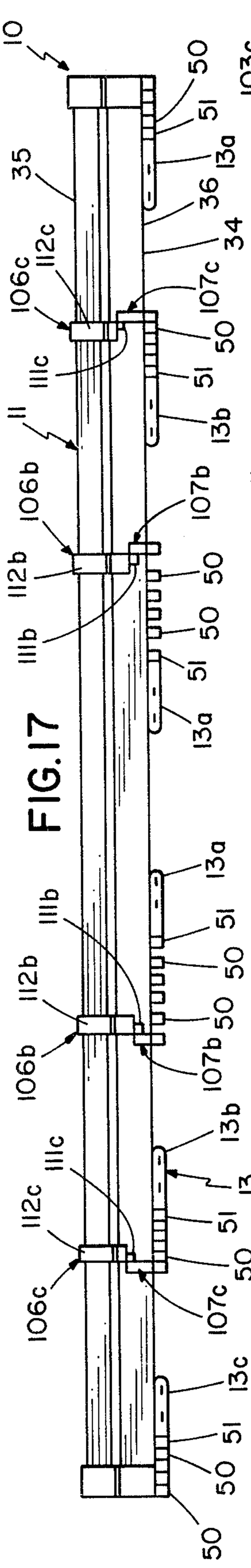

FIG. 17

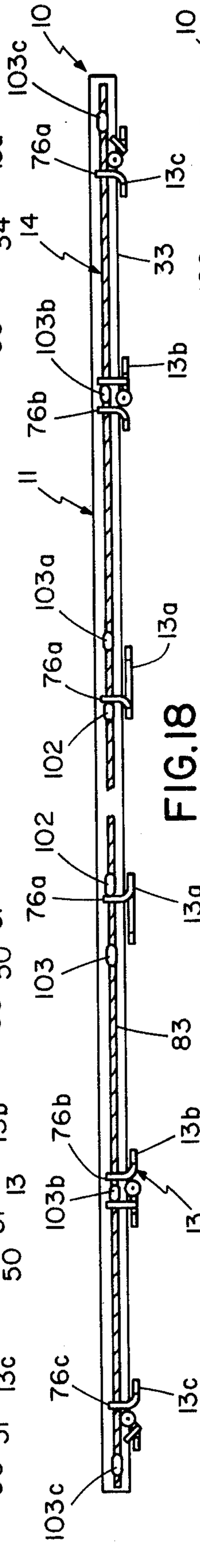

FIG. 18

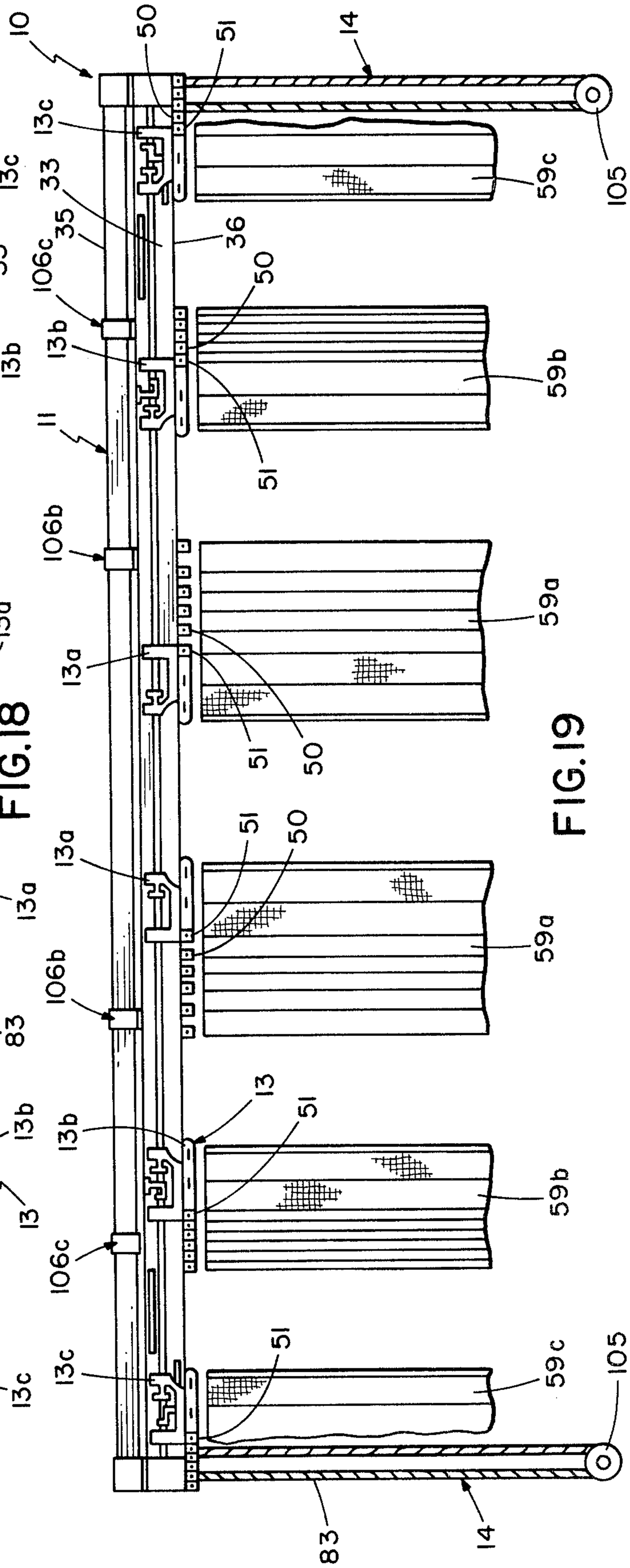

FIG. 19

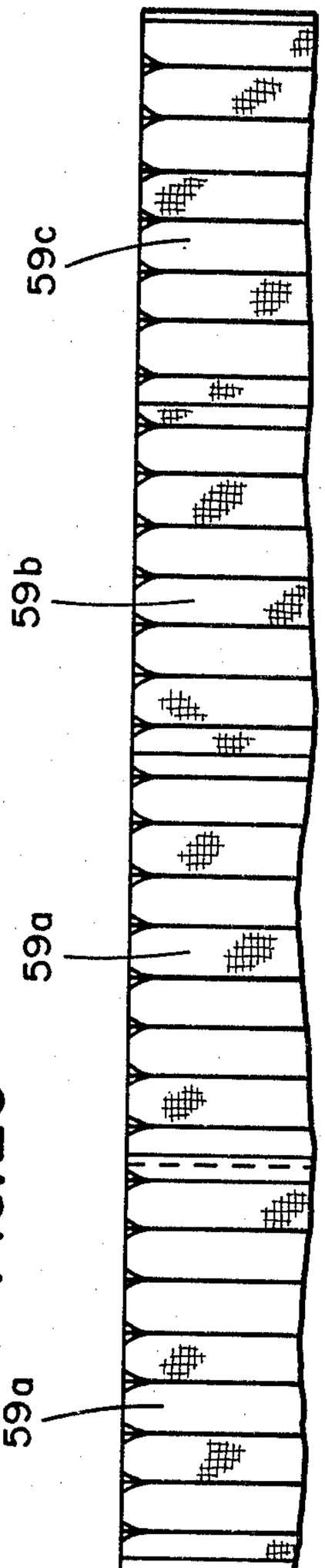

FIG.20

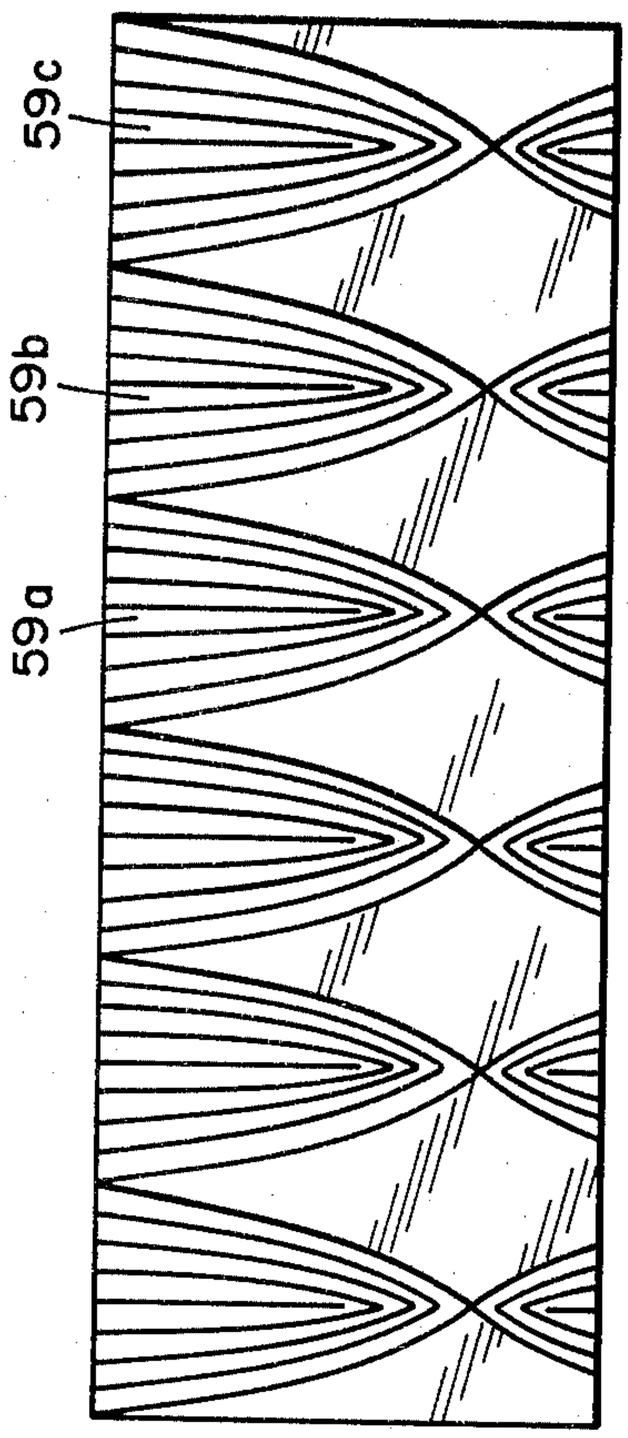

FIG.22

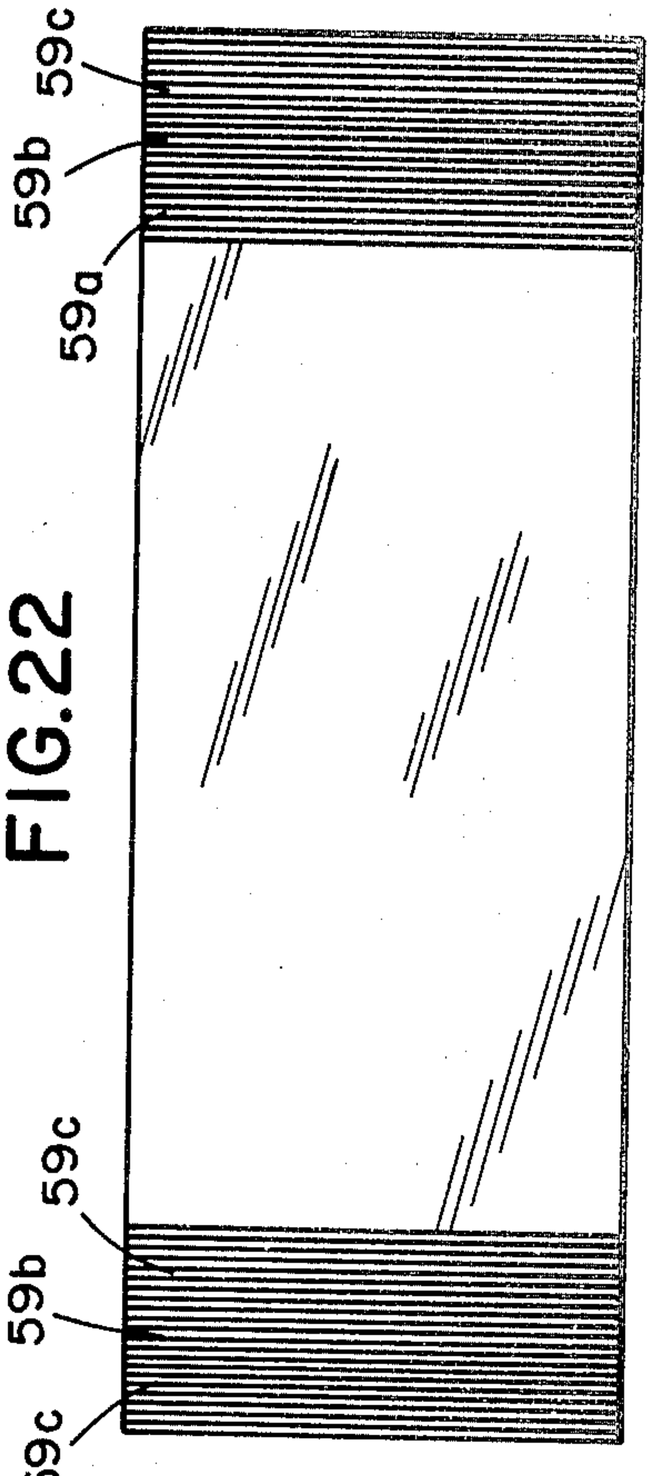

FIG.24

FIG.21

FIG.23

DRAPERY HANGER AND MANIPULATOR

SUMMARY OF THE INVENTION

This invention relates to an improved drapery hanger and manipulator for supportably hanging and selectively manipulating drapery curtains of a series of drapery curtain panels by means of groups of drapery hook hangers and drapery carriers slidably mounted in a traverse track bridge and selectively driven and otherwise manipulated to individually spread or collapse the respective curtain panels over the area to be covered with manipulating means whereby the individual panels can be made to individually completely cover a given area, to be collapsed within said area to allow light to pass therebetween, and to be variably positioned over said area and moved along the overall area to a selected position therealong.

In the known types of drapery or curtain supporting devices, it is a common facility thereof to provide some means by which draperies or curtains can be manipulated from side to side or from top to bottom or even rotated in place over a given area to be covered by the drapes or curtains. To accomplish this, the drapery holders in known types of devices slide or otherwise merely move the drapes or curtains to and fro by pulling on one end or the other of the drapes, or to rotate the drapes about a given position, to complete, or partially complete, the closing of the opening to be covered thereby.

It is a general primary object of the drapery hanger and manipulator of this invention to provide a drapery curtain hanger and manipulator which, when operated, will provide selective positioning of independent segments of drapery curtains, over or along an area to be covered thereby, and with a selective degree of extension or collapse in addition to being selectively positionable along the opening to be affected thereby.

Further, it is an object of this invention to provide a drapery hanger and manipulator which is selectively operated to and fro across the drapery area and yet be selectively expandable or collapsible in any position over that area by the selective bilateral operation of a single linear drive or actuating means.

Other advantages and novel aspects of this invention will become apparent from the following detailed description, in conjunction with the accompanying drawings wherein:

FIG. **1** is a partially cutaway partial perspective view of a first embodiment of the drapery hanger and manipulator of this invention showing a traverse track bridge, cam means, drapery hook hanger means, drapery carriers, linear drive means, cam followers, the retainer means, and the mechanical interrelationship of these structures;

FIG. **2** is a perspective view of a drapery carrier of the first embodiment of the invention showing the linear drive therethrough and a cam follower pivotally connected thereto, and the drapery carrier drivingly connected with the linear drive means for drive in either direction;

FIG. **3** is a perspective view of a drapery carrier of the first embodiment of the invention without the cam follower and connecting structure, illustrating a lead carrier;

FIG. **4** is a partially cutaway partial perspective view showing the traverse track bridge mounting assembly, retaining means and drapery hook hangers;

FIg. **5** is a partially cutaway partial perspective view of a traverse track bridge of a second embodiment of this invention showing a first and second track means positioned horizontally with respect to each other, and the structure of the traverse track bridge, cam means, drapery hook hangers, drapery carriers, linear drive means, cam follower and retainer means, and the mechanical interrelationship of these structures;

FIG. **6** is a perspective view of the drapery carrier of the second embodiment of this invention showing the linear drive therethrough and a cam follower pivotally connected thereto, and the drapery carrier drivingly connected with the linear drive means for drive in either direction;

FIG. **7** is a sectional view of a traverse track bridge suitable for the second embodiment of this invention showing how the bridge could be formed from a folded sheet into two telescoping portions to provide an adjustable length for the bridge;

FIG. **8** is a schematic front elevation view of the drapery hanger and manipulator of the first embodiment of this invention showing the position of the bridge, retainers, drapery carriers, and drapery hook hanger means when the drapery hanger and manipulator is in the full open position;

FIG. **9** is a partially sectioned schematic top view of the first embodiment of this invention illustrating the relative interconnection between the linear drive means and the drapery carriers when the drapery hanger and manipulator is in the full open position;

FIG. **10** is a rear schematic elevation view of the drapery hanger and manipulator of this invention with the traverse track bridge partially sectioned showing the position of the drapery carriers on said track when said drapery hanger and manipulator is in the full open position;

FIG. **11** is a schematic front elevation view of the drapery hanger and manipulator of the first embodiment of this invention showing the lead drapery carrier being actuated to an intermediate position along the traverse track bridge to provide a partially closed position of the drapery hanger and manipulator;

FIG. **12** is a partially sectioned schematic top view of the first embodiment of this invention illustrating the relative interconnection between the linear drive means and the drapery carriers when the drapery hanger and manipulator is in the partially closed position;

FIG. **13** is a rear schematic elevation view of the drapery hanger and manipulator of this invention with the traverse track bridge partially sectioned showing the position of the drapery carriers on said track when said drapery hanger and manipulator is in the partially closed position;

FIG. **14** is a schematic front elevation view of the drapery hanger and manipulator of the first embodiment of this invention showing the lead drapery carrier being actuated to a central overlapping position along the traverse track bridge to provide a fully closed position of the drapery hanger and manipulator;

FIG. **15** is a partially sectioned schematic top view of the first embodiment of this invention illustrating the relative interconnection between the linear drive means and the drapery carriers when the drapery hanger and manipulator is in the fully closed position;

FIG. **16** is a rear schematic elevation view of the drapery hanger and manipulator of this invention with the traverse track bridge partially sectioned showing the position of the drapery carriers on said track when said drapery hanger and manipulator is in the fully closed position;

FIG. **17** is a schematic front elevation view of the drapery hanger and manipulator of the first embodiment of this invention showing the lead drapery carrier being actuated from the central position along the traverse track bridge to provide a partially spaced open position of the drapery hanger and manipulator;

FIG. **18** is a partially sectioned schematic top view of the first embodiment of this invention illustrating the relative interconnection between the linear drive means and the drapery carriers when the drapery hanger and manipulator is being actuated from the central closed position to the partially spaced open position;

FIG. **19** is a rear schematic elevation view of the drapery hanger and manipulator of this invention with the traverse track bridge partially sectioned showing the position of the drapery carriers on said track when said drapery hanger and manipulator is being urged to the partially spaced open position;

FIG. **20** shows the condition of the drapes with the carrier elements in the position as shown in FIG. **15** and with the drapes in an unrestricted closed position;

FIG. **21** is a front elevation view of drapery curtains showing a drapery design which can be accomplished by tying back selected ones of said drapery curtain panels, and with the drapery curtain hanger and manipulator moved to the fully closed position;

FIG. **22** is a front elevation view of drapery curtains showing a drapery design which can be accomplished by tying back alternate selected ones of said drapery curtain panels, and with the drapery curtain hanger and manipulator moved to the fully closed position;

FIG. **23** is a front elevation view of curtains of the drapery hanger of this invention showing the semi-open and spaced apart position which may be accomplished by the drapery hanger and manipulator of this invention after being first closed and then partially reopened; and

FIG. **24** is a front elevation view of curtains of the drapery hanger and manipulator of this invention showing the fully open position which may be accomplished by the drapery hanger and manipulator of this invention.

A first embodiment of the drapery hanger and manipulator of this invention is disclosed specifically in FIGS. **1–4**, and generally in FIGS. **8–20**, and is generally illustrated by the numeral **10**. This first embodiment includes generally, a traverse track bridge **11**, drapery hook hanger means **12**, drapery carrier means **13**, linear drive means **14** and retainer means **15**.

Traverse track bridge **11** is provided with an adjustable mount **20** (FIG. **4**) to mount traverse track bridge **11** to a wall or other structure over an area to be covered by a drapery. Adjustable mounting structure **20** is shown to include an angle bracket **21** adjustably secured to a telescoping extension support **22** having a clamp **23** secured to support **22** at **24** and adapted with hooking element **25** to be secured over longitudinally extending ribs or flanges **26** of bridge **11**. Mount **20** is secured to a wall by screws through openings **27**, and telescoping member **22** is adjustably positioned in bracket **21** and retained therein by retaining element **28** common to both the bracket and the extension, through slots **29**.

Traverse track bridge **11** includes generally, a first track **30** (FIGS. **1** and **4**); a second track **31** (FIGS. **1**, **4**, **10**, **13**, **16** and **19**); cam means **32** longitudinally spaced apart on back surface panel **34** of bridge **11**. Traverse track bridge **11** is also provided with a front surface panel **33**, a top surface panel **35** and a bottom surface panel **36**. First track **30** is provided with an upper track **40** having opposite lower surfaces **41** and **42** and intermediate opposed surfaces **43** and **44**. Second track means **31** has upper track edge **45** and lower track edge **46** in rear panel surface **34**.

Cam means **32** includes slots **47** at selected longitudinal postiions along rear panel surface **34** of bridge **11** above second track **31** and are provided with a cam incline **48** at the ends thereof to connect slots **47** with upper rear panel surface **34**. Cam means **32** also includes slots **47***a* at selected longitudinal positions along rear panel surface **34** of bridge **11** below second track **31** and are provided with a cam incline **48***a* at the ends thereof to connect slots **47** with lower rear panel surface **34**.

Drapery hook hanger means **12** includes a series of individual drapery hook hangers **50** (FIGS. **1**, **4**, **8**, **10**, **11**, **13**, **14**, **16**, **17** and **19**) interspersed between similar drive transmitting drapery hook hangers **51**. Hook hangers **50** and **51** have a main vertical body portion **52** with upper oppositely laterally extending stabilizing support runners **53** vertically spaced apart from similar lower runners **54** on said body **52**. A drapery support aperture **58** is provided through the lower extension of portion **52** upon which separate respective drapery panels **59***a*, **59***b* and **59***c* are hung in the usual manner.

Upper runners **53** are provided with lower surface **55** adapted to slidably engage surfaces **41** and **42** of first track **30**. Lower stabilizing runners **54** are provided with respective upper surfaces **56** adapted to engage lower surface **36** of first track **30** of bridge **11**. Upper and lower runner portions **53** and **54** thereby complementally and respectively engage surfaces **41–42** and **36** to slidably attach hangers **50** and **51** in first track **30** of bridge **11** and to prevent hangers **50** and **51** from turning or otherwise becoming disoriented in sliding attachment with track **30**.

Drive transmitting hook hangers **51** differ from individual hook hangers **50** in that drive hangers **51** are attached to respective drapery carriers **13** by rivets **57** or other means of attachment whereby movement of carriers **13** will likewise cause movement of respective drive transmitting hook hangers **51** along track means **30** in serial association with interspaced individual hangers **50**.

Drapery carrier means **13** includes three types of carriers **13***a*, **13***b* and **13***c*. Carrier **13***a* is a lead or primary carrier (FIG. **3**). Carrier **13***b* is an intermediate follower drapery carrier (FIG. **1**) and carrier **13***c* is a secondary follower carrier (FIGS. **1** and **2**). Carriers **13***a*, **13***b* and **13***c* are similar in that they are each provided with a carrier frame **60** having a forward end **61**, and a reverse end **62**. Also, carriers **13***a*, **13***b* and **13***c* each have a drapery supporting bracket **63** extending downwardly with drapery hook support openings **64**.

A carrier hook drive bracket **65** is also provided, on carriers **13***a*, **13***b* and **13***c*, extending downwardly therefrom and having a single drapery hook support opening **66** positioned to be aligned with respective carrier bracket opening **58**. Carrier hook bracket **65** has a drive transmitting hook hanger **51** attached thereto by rivets **57** as previously generally referred to. Drive transmitting hook hangers **51** thereby slidably mount carriers

13*a*, 13*b* and 13*c* in first track 30 for movement therealong with drive transmitting hook hangers 51.

Carrier frames 60 are provided with a pair of track guides 67 and 68 having respective track receiving slots 69 and 70 in the top, track receiving slots 71 and 72 in the bottom, and being respectively positioned adjacent forward and reverse ends 61 and 62 of carrier frame 60. Track guides 67 and 68 are thereby adapted to complementally and slidably support respective carriers 13*a*, 13*b* and 13*c* (FIGS. 1–3).

A cable guide 73 is provided on each track guide 67 and 68 to loosely guide a section of linear drive 14 relative to the carrier of said guides. Carriers 13*a*, 13*b* and 13*c* (FIGS. 1–3, 9, 12, 15 and 18) are also provided with forward drive receiving elements 76*a*, 76*b* and 76*c* respectively and includes right angle drive arms 77*a*, 77*b* and 77*c* extending from adjacent lead guide 67 of respective frames 60. Eyelets 78*a*, 78*b* and 78*c* are provided in each drive receiving structure 76 and have openings 79*a*, 79*b* and 79*c* to accommodate drive 14.

It should be noted that carriers 13*a*, 13*b* and 13*c*, as shown (FIGS. 1–3) are adapted to be positioned on the left rear side of bridge 11 (FIGS. 10, 13, 16 and 19). Carriers 13*a*, 13*b* and 13*c* for the right rear side of the drapery hanger and manipulator of this invention are image structures of the carriers 13*a*, 13*b* and 13*c* as set forth herein for the left side of manipulator 10.

Carrier 13*b* (FIGS. 1 and 8–19) is provided with a reverse drive means in the form of a two-pronged fork lock 81 (FIG. 1). Lock 81 is attached to a bracket 82 which, in turn, is pivotally mounted by a pin 83 to a cam lock platform 84 extending from carrier frame 60. A tension spring 85 is interconnected between anchor opening 86 to drive receiving fork 81 and an opening 87 in platform 84 to normally bias fork 81 in a counterclockwise direction (FIG. 1).

A cam follower wheel 88 is rotatably mounted on pin 89 on an L-shaped bracket 90 connected to bracket 82 by short link 90*a* adjacent pivot pin 83. Wheel 88 is adapted to normally engage surface 34 of bridge 11 and to enter cam slot 47 by incline 48, as carrier 13*b* is moved along bridge 11, to allow the normal bias of spring 85 to rotate reverse drive fork 81 counterclockwise about pin 83.

It should be noted that the moment arm of link 82 is much longer than the moment arm of bracket 90*a* relative to pivot pin 83 whereby a small amount of movement of the axis of wheel 88 between slot 47 and surface 34 will cause a much greater movement of reverse drive receiving fork 81 (FIG. 1) in the clockwise direction. In this regard, as carrier 13*b* is moved along bridge 11 to the right, or forward closing direction, until wheel 89 moves out of slot 47 and engages surface 33, reverse drive fork 81 and wheel bracket 90*a* will be caused to rotate in the clockwise direction about pin 83, urging fork 81 into adjacent position with respect to drive receiving means 14.

Similarly, carrier 13*c* (FIGS. 1, 3 and 8–19) is provided with a reverse drive means in the form of a two-pronged fork lock 91 (FIGS. 1 and 2). Lock 91 is attached to a bracket 92 which, in turn, is pivotally mounted by a pin 93 to a cam lock platform 94 extending from carrier frame 60. A tension spring 95 is interconnected between anchor opening 96 of drive receiving fork 91 and an opening 97 in platform 94 to normally bias fork 91 in a counterclockwise direction (FIGS. 1 and 2).

A cam follower wheel 98 is rotatably mounted on pin 99 on an L-shaped bracket 11 connected to bracket 92 by short link 100*a* adjacent pivot pin 93. Wheel 98 is adapted to normally engage surface 33 of bridge and to enter cam slot 47 by incline 48*a*, as carrier 13*c* is reversed along bridge 11, to allow the normal bias of spring 95 to rotate reverse drive fork 91 counterclockwise about pin 93.

It should be noted that the amount arm of link 92 is much longer than the moment arm of bracket 100*a* relative to pivot pin 93 whereby a small amount of movement of the axis of wheel 99 between slot 47*a* and upper surface 33 will cause a much greater movement of reverse drive receiving fork 91 (FIGS. 1 and 2) in the clockwise direction. In this regard, as carrier 13*c* is moved along bridge 11 to the right, or forward closing direction until wheel 98 moves out of slot 47*a* and engages the lower surface 33, reverse drive fork 91 and wheel bracket 100*a* will be caused to rotate in a clockwise direction about pin 93, urging fork 91 into adjacent position with respect to drive receiving means 14 (FIG. 2).

Linear drive 14 includes two sections of flexible cord or cable 101 (FIGS. 1–3, 9, 10, 12, 13, 15, 16, 18 and 19) having ends joined by clamps or connectors 102 to provide a continuous cable. Clamps 102 have a lateral dimension (FIG. 3) to provide a drive transmitting element for anything closely surrounding cable 101. Further, lateral extending drive projections 103*a*, 103*b* and 103*c* are affixed to cable 101 at spacedapart intervals therealong to respectively similarly provide a drive transmitting element.

Drive projections 103*a*, 103*b* and 103*c* on the left rear side of a bridge 11 (FIGS. 9, 10, 12, 13, 18 and 19) are respectively progressively larger in a direction to the left, and similarly, drive projections 103*a*, 103*b* and 103*c* on cable 101 on the right rear side of bridge 11 are respectively progressively larger in a direction to the right. Cable 101 is threaded over pulleys 104 (FIG. 13) to direct cable 101 in both directions of movement, at right angles from along bridge 11 to a downward direction (FIGS. 13, 16 and 19), and is further retained rotatably about similar pulleys 105 at opposite sides to allow cable 101 to be moved continuously through the bridge 11 and carriers 13 of this invention and to provide oppositely moving cable sections 101 in bridge 11 as cable 101 is moved over pulleys 104 and 105.

Retainer means 15 (FIGS. 4, 8, 10, 11, 13, 14, 16, 17 and 19) includes a series of magnetic stops 106*b* and 106*c* and respective stop retainer bumpers 107*b* and 107*c*. Stops 106*b* and 106*c* are secured to bridge 11 by mounting plates 108*b* and 108*c* having hooks 109 extending over front and rear flanges 26 of bridge 11. Stops 106*b* and 106*c* are selectively positioned along the length of bridge 11 and held in a selected position by set screws 110 or the like. Magnets 111*b* and 111*c* are respectively secured to extension plates 112*b* and 112*c* of each stop 106*b* and 106*c* and stops 106*b* and 106*c* have a progressively different length extension 112*b* and 112*c* as spaced along bridge 11 (FIGS. 4, 8, 11, 14 and 17) with the progressively longer stops 106*b* and 106*c* positioned inwardly from the outer ends of bridge 11.

Bumpers 107*b* and 107*c* (FIGS. 4 and 14) are respectively provided for each retainer stop 106*b* and 106*c* and include a plate bracket 113*b* or 113*c* respectively and are adapted to complementally engage a selected hook hanger 50 and are secured thereto by rivets 114 (FIG. 4) or the like. Bumper plates 108*b* and 108*c* are respec-

tively provided with a magnet **115***b* and **115***c* secured in the upper portion thereof.

Conversely to the progressive length of stops **106***b* and **106***c*, respective bumper plates **108***b* and **108***c* are progressively shorter towards the center of the bridge **11**. As individual hook hangers **50**, to which the bumper plates **108***b* and **108***c* are secured, are moved along bridge **11**, the shorter plates **108***b* will pass by shorter retainer stops **112***c* and only the respective complementary plates **112***b* and **112***c* for the corresponding magnet stops **111***b* an **111***c* will engage the corresponding respective magnets of bumpers **107***b* and **107***c*. Thus, as carriers **13***a*, **13***b* and **13***c* are moved toward the center of bridge **11**, carrying the hook hangers **50** and draperies **59***a*, **59***b* and **59***c* in that same direction, bumpers **108***b* and **108***c* will correspondingly respectively engage the conversely lengthed stops **111***b* and **111***c* (FIG. **17**).

It should be noted that when carriers **13***a*, **13***b* and **13***c* are moved from the center toward the respective edges of bridge **11**, stop magnets **111***b* and **111***c* and respective bumper plate magnets **115***b* and **115***c* will tend to retain the hook hanger **50**, through which the said respective bumper plates **115***b* or **115***c* are attached, until carriers **13***a*, **13***b* and **13***c*, through serial engagement of hook hangers **50**, will physically force the disengagement of bumper plate magnets **115***b* and **115***c*, from respective stop magnets **111***b* and **111***c*. In the interim, carriers **13***a*, **13***b* and **13***c* have a freedom of movement in either direction, along bridge **11**, without causing bumper plates **113***b* and **113***c* to separate magnetically from respective retainer stops **106***b* and **106***c*, thus selectively holding drapery panel ends adjacent their respective bumpers from moving toward the ends of bridge **11**.

A second embodiment of the drapery hanger and manipulator of this invention is disclosed specifically in FIG. **5**, and generally, in FIGS. **8–20**, and is generally illustrated by the numeral **120**. Second embodiment **120** includes generally, a traverse track bridge **121**, drapery hook hanger means **122**, drapery carrier means **123**, linear drive means **124** and retainer **125**. Traverse track bridge **121** is mounted to support draperies, in any conventional manner, or as shown (FIG. **7**).

Traverse track bridge **121** includes, generally, a first track **130** (FIG. **5**); a second track **131** (FIG. **5**), cam means **132** longitudinally spaced apart on bottom surface panel **133** of bridge **121**. Traverse track bridge **121** is also provided with a front surface panel **134**, a back surface panel **135** and a top surface panel **136**. First track **130** is provided with a front track **140** having opposite upper surfaces **142** and **142** and lower opposite surfaces **143** and **144**. Second track means **131** has forward track edge **145** and rear track edge **146** in panel surface **133**.

Cam means **132** includes slots **147** at selected longitudinal positions along panel surface **133** of bridge **121** in rear of second track **131**. Drapery hook hanger means **122** includes a series of individual drapery hook hangers **150** as shown in FIGS. **1**, **4**, **8**, **10**, **11**, **13**, **14**, **16**, **17** and **19**, interspersed between similar drive transmitting drapery hook hangers **151**. Hook hangers **150** and **151** have a main vertical body portion **152** with upper oppositely laterally extending stabilizing support runners **153** vertically spaced apart from similar lower runners **154** on body **152**. A drapery support aperture **158** is provided through the lower extension of portion **152**.

Upper runners **153** are provided with lower surface **155** adapted to slidably engage surfaces **141** and **142** of first track **130**. Lower stabilizing runners **154** are provided with respective upper surfaces **156** adapted to engage lower surface **136** of first track **130** of bridge **121**. Upper and lower runner portions **153** and **154** thereby complementally and respectively engage surfaces **141**, **142** and **136** to slidably attach hangers **150** and **151** in first track **130** of bridge **121** and to prevent hangers **150** and **151** from turning or otherwise becoming disoriented in sliding attachment with track **130**.

Drive transmitting hook hangers **151** differ from individual hook hangers **150** in the same manner as that described above in regard to the first embodiment of this invention, in that drive hangers **151** are attached to respective drapery carriers **123** by rivets **157** or other means of attachment whereby movement of carriers **123** will likewise cause movement of respective drive transmitting hook hangers **151** along track means **130** in serial association with interspaced individual hangers **150**.

Drapery carrier means **123** includes multiple carriers provided with a carrier frame **160** having a forward end **161** (FIG. **6**), and a reverse end **162**. Also, carriers **123** have a drapery supporting bracket **163** extending downwardly. A carrier hook drive bracket **165** is also provided, on carriers **123**, extending downwardly therefrom and having a single drapery hook support opening positioned to be aligned with respective carrier bracket opening **158**. Carrier hook bracket **165** has a drive transmitting hook hanger **151** attached thereto by rivets **157** in a manner as previously generally referred to. Drive transmitting hook hangers **151** thereby slidably mount carriers **123** in first track **130** for movement therealong with drive transmitting hook hangers **151**.

Carrier frames **160** are provided with a pair of track guides **167** and **168** having respective track receiving slots **169** and **170** toward the back, track receiving slots **171** and **172** toward the front, and being respectively positioned adjacent forward and reverse ends **161** and **162** of carrier frame **160**. Track guides **167** and **168** are thereby adapted to complementally and slidably support respective carriers **123** in second track **131** (FIG. **5**).

A cable guide opening **173** is provided on each track guide **167** and **168** to loosely guide a section of linear drive **124** relative to respective carriers **123**. Carriers **123** are also provided with a forward drive receiving element **176** which includes a right angle drive arm **177** extending from adjacent lead guide **168** of frame **160**. Eyelets **178** are provided in each drive receiving structure **176** and have an opening **179** to accommodate drive **124**.

It should be noted that carriers **123** are adapted to be positioned on the left rear side of bridge **121**. Carriers **123** for the right rear side of the drapery hanger and manipulator of this invention are merely image structures of the carriers **123** as set forth herein for the left side of manipulator **120**.

Carriers **123** are provided with a reverse drive means in the form of a two-pronged fork lock **181** (FIGS. **5** and **6**). Lock **181** is attached to a bracket **182** which, in turn, is pivotally mounted by a pin **183** to a cam lock platform **184** extending from carrier frame **160**. Drive receiving fork **181** is normally biased in a counterclockwise direction about pin **183** (FIG. **5**) by reason of the greater weight of fork **181** and bracket **182** than a cam follower wheel **188**, which is rotatably mounted on a pin **189** on arm **190** connected to bracket **182** adjacent pivot pin **183**. Wheel **188** is adapted to normally engage surface **133** of bridge **121** and to enter cam slot **147** as

carrier **123** is moved along bridge **121**, to allow the normal gravity bias of reverse drive fork **181** to urge fork **181** counterclockwise about pin **183**.

It should be noted that the moment arm of link **182** is much longer than arm **190** relative to pivot pin **183** whereby a small amount of movement of the axis of wheel **189** between slot **147** and surface **133** will cause a much greater movement of reverse drive receiving fork **181** (FIG. **5**) in the clockwise direction. In this regard, as carrier **113** is moved along bridge **121** to the right, or forward closing direction, until wheel **188** moves out of slot **147** and engages surface **133**, reverse drive fork **181** and wheel bracket **190** will be caused to rotate in the clockwise direction about pin **183**, urging fork **181** into adjacent position with respect to drive receiving means **124**.

Linear drive **124** includes a continuous flexible cord or cable **182** (FIGS. **5** and **6**) which is constructed, mounted and operated like the linear drive set forth above for the first embodiment herein, and as shown (FIGS. **9**, **10**, **12**, **13**, **15**, **16**, **18** and **19**). Also, bridge **121** can be constructed as one piece or by telescoping sections **121***b* and **121***c* (FIG. **7**) to be mounted to the ceiling or other horizontal surface **200**.

As a preliminary basis to the understanding of the operation of this invention, the operation of linear drive **124** should be considered. In particular, linear drive **124** is a double section of cables **101** joined by connectors **102**. Connectors **102** are of sufficient lateral dimension to comprise a necessary drive aspect of linear drive **124** (FIGS. **9**, **12**, **15** and **18**). In addition to drive elements **102**, each section of cable **101** is provided with a series of drive projections **103***a*, **103***b* and **103***c* (FIGS. **1–3** and **8–19**) which are selectively spaced along their respective sections of cable **101**.

One section **101** is threaded through guides **73** of eyelets **78** and the left or right series of carriers **13**, and the other cable section is threaded through guides **73** and eyelets **78** of the other series of carriers **13** so as to be in controlled proximity therewith and to provide opposite direction drive reaction with eyelets **78** of carrier means **13**. This will simultaneously provide opposite direction drive for carriers on the left from those on the right. Thus, the respective series of carriers **13** on the left side of bridge **11** and the right side of bridge **11** will always be driven in opposite directions, either both toward the center of bridge **11** to tend to close the drapes **59**, or to the outer ends of bridge **11** to tend to open drapes **59**. Drive elements **103***a*, **103***b* and **103***c* of each series of each side or section of cable **101** are progressively larger in a direction from the center of bridge **11** to pulley **104** and pulley **105**. Also, eyelets **78***a*, **78***b* and **78***c* of corresponding carriers **13***a*, **13***b* and **13***c* are similarly larger by respective openings **79***a*, **79***b* and **79***c* thereof whereby when cable **101** of drive **14** is urged through eyelets **78***a*, **78***b* and **78***c* from the edge of bridge **11** toward the center thereof, the smaller drive elements **103***a* will pass through eyelets **78***b* and **78***c* of drive receiving elements **76***b* and **76***c* of corresponding carriers **13***b* and **13***c*. However, drive elements **103***a* will not pass through eyelet **78***a* of drive element **76***a* of corresponding carrier **13***a* and will thereby tend to urge carrier **13***a* in a direction of linear movement toward the center of bridge **11** by the engagement of drive element **103***a*. Similarly, drive elements **103***b* will pass through eyelet **78***c* of carrier **13***c* without engaging same but will engage eyelet **78***b* of corresponding drive receiving element **76***b* of corresponding carrier **13***b* to drive carrier **13***b* lineally along bridge **11** toward the center thereof. The largest drive element **103***c* will engage respective eyelet **78***c* of drive elements **76***c* of corresponding respective carriers **13***c* whereby linear movement of cable sections **101** toward the center of bridge **11** will similarly urge carriers **13***c* toward the center of bridge **11**.

The operation of the first embodiment of the invention is performed by manipulation of linear drive **14** to either: close the drapes **59** by operating drive **14** in the forward direction to cause carriers **13** to move from adjacent the outer ends of bridge **11** toward the center (FIGS. **8–16**); partially intermittently open drapes **59** by partial reverse movement of linear drive **14** from a partially closed condition of the drapes **59**, or a fully closed condition of the drapes **59**, to selectively provide intermittent partially adjusted opened condition for the drapes **59** (FIGS. **17–19**); and open drapes **59** by full reverse movement of linear drive **14** to provide the fully opened condition for drapes **59** (FIGS. **8–10**).

Initially, the drapery hanger and manipulator **10** can be considered in the open position (FIGS. **8–10** and **24**) with intermittently positioned groups of hook hangers **50** in track and in line with interpositioned series of carriers **13***a*, **13***b* and **13***c* stacked or otherwise positioned adjacent the outer ends of bridge **11** (FIG. **10**). In this initial position, driving elements **103***b* and **103***c* of linear drive **14** are withdrawn from within bridge **11**, and lead drive elements **103***a* and center drive elements **102** (FIG. **9**) of opposite midpoints of linear drive **14**, are within bridge **11**.

Linear drive **14** is thereupon actuated by manually urging inner vertical cable portion, of respective extending cables **101**, downwardly (FIG. **10**) causing the outer vertical portion of cable sections **101** to move upwardly and over respective pulleys **104** into bridge **11** (FIGS. **8–10**). As cable sections **101** are thus moved in bridge **11**, central drive elements **102** will each move toward the center of bridge **11** and the immediately adjacent next drive element **103***a* will engage its respective drive receiving eyelet **78***a* of drive element **76***a* of corresponding carrier **13***a* (FIGS. **3** and **9**) to urge carrier **13***a* toward the center of bridge **11** tending to close the inner drape section **59***a* toward the middle (FIGS. **11–13**).

Continued movement of cable sections **101** of linear drive **14** into bridge **11** (FIGS. **11–13**) will continue this movement of carriers **13***a* toward the center of bridge **11** until the next larger driver **103***b* engages its correspondingly next larger size drive receiving eyelet **78***b* of its corresponding carrier **13***b* to urge carrier **13***b* similarly toward the center of bridge **11** tending to close the next respective drape section **59***b* (FIGS. **11–16**).

Further continued movement of cable sections **101** of linear drive **14** will urge the third and progressively largest drive element **103***c* (FIGS. **14–16**) into bridge **11** toward the center thereof and into eventual engagement with its corresponding eyelet **78***c* of drive receiving element **76***c* of corresponding carrier **13***c* to similarly urge carrier **13***c* toward the center of bridge **11**. Continued final movement of cable **101** of linear drive **14** to urge carriers **13***a*, **13***b* and **13***c* from opposite sides of bridge **11** until carriers **13***a* engage in the center of bridge **11** (FIGS. **14–16**).

Bumpers **107***c* are of an appropriate length whereby the magnets **115***c* thereof will be caused to engage the magnets **111***c* of stop **106***c* only. Thus, as carriers **13***a*, **13***b* and **13***c* are urged from adjacent the ends of bridge

11 towards the center as above set forth, carriers 13*a* will be allowed to engage in the center (FIG. 11) without being stopped, bumpers 107*b* thereof will bypass stop 112*c* and eventually be engaged by stop 112*b* (FIGS. 14–16), and bumpers 107*c* will respectively engage corresponding stops 112*c*, all of which will cause drapes 59*a*, 59*b* and 59*c* to be serially extended to the closed position along bridge 11 (FIGS. 14–16 and 20).

As cable 101 is urged in the opposite or reverse direction, from the center toward the ends of bridge 11, drive elements 103*a*, 103*b* and 103*c* are normally able to pass out of bridge 11 and downwardly toward pulley 105 (FIG. 10) without driving effect on carriers 13*a*, 13*b* or 13*c*.

As carriers 13*a*, 13*b* and 13*c* are moved from the edge of bridge 11 toward the center as above described, and as progressively larger drive elements 103*a*, 103*b* and 103*c* progressively engage their corresponding respective eyelets 78*a*, 78*b* and 78*c* of respective corresponding carriers 13*a*, 13*b* and 13*c* to urge same toward the center, reverse drive receiving means of linear drive 14 are also being progressively actuated. In particular, as carriers 13*a*, 13*b* and 13*c* are moved from the end toward the center of bridge 11, respective cam followers 88 and 98 of cam means 32 and carriers 13*b* and 13*c* respectively are selectively exposed to cam surface 34 and cam slots 47 which are selectively positioned along cam surface 34.

As carriers 13*b* and 13*c* are moved from the ends to the center of bridge 11, cam means 32 is thus actuated by the engagement of wheels 88 or 98 out of slots 47*a* to cause forks 81 and 91 to be urged into surrounding position with respect to linear drive cable 101 (FIGS. 2, 9, 12, 15 and 18) whereby respective drive elements 103*b* and 103*c* are retained between corresponding carrier eyelets 78*b* and 78*c* and corresponding reverse drive retaining fork 81 or 91. In this condition, movement in either direction of cable 101 of linear drive 14 will cause corresponding movement of carriers 13*b* or 13*c* by virtue of respective forks 81 or 91 being positioned in proximity with cable 101 of linear drive 14 and the drivers 103*a*, 103*b* and/or 103*c*.

Thus, movement in either direction will then urge the carriers correspondingly until a given carrier 13*b* or 13*c* is moved in the reverse direction to a point where respective cam wheel 88 or 98 will be moved into slot 47 or 47*a* respectively. At which time, forks 81 and 91 will be respectively and selectively removed from driving relationship with linear drive 14, by pivoting away from cable 101 about pins 83 or 93, to allow continued movement of the corresponding carriers 13 to remove the drapes toward the ends of bridge 11.

As linear drive 14 is manipulated to move carriers 13 from the ends of bridge 11 toward the center thereof, carriers 13*b* and 13*c* are eventually picked up by the drive elements and moved across the opening to close the drapes in accordance with movement of linear drive 14. However, reverse movement of linear drive 14 does not similarly reverse the movement of carriers 13*b* and 13*c* in view of the above-described selectivity of the reverse drive mechanism.

In particular, when the sections of the cable 101 are moved in opposite directions away from the center of bridge 11 toward the ends thereof, drive elements 103*b* and 103*c* of each series of carriers 13*a*, 13*b* and 13*c* will initially be urged toward the respective ends of bridge 11 by virtue of reverse drive forks 81 and 91 of corresponding carriers 13*b* and 13*c*. Substantially simultaneously, drive respective elements 102 will similarly urge respective carriers 13*a* in the reverse direction respectively toward the ends of bridge 11.

Thus, the lead edges of drapery panels 59*a*, 59*b* and 59*c* of each series will be urged from the central area toward the ends of bridge 11 by corresponding respective carriers 13*a*, 13*b* and 13*c*, and initially, without disturbing the retention stop created by the magnetic engagement of bumpers 107*b* and 107*c* with respective corresponding stops 112*b* and 112*c*. This will cause the intermittent collapse and corresponding opening of each panel 59 from the center to the ends of bridge 11 (FIGS. 17–19) to create the intermittent drapery effect (FIG. 23).

Under these circumstances, continued movement of respective drive cables 101, in the direction from the center of bridge 11 toward the end thereof, will cause carriers 13*a*, 13*b* and 13*c* of each series of carriers 13*a*, 13*b* and 13*c* to serially stack along bridge 11 with carrier hooks 50 intersperced and thus force the disengagement of bumpers 107*b* and 107*c* from respective corresponding stops 112*b* and 112*c* allowing all drape sections 59*a*, 59*b* and 59*c* to be moved completely to the right or open position (FIGS. 8–10 and 24).

Thus, it can be seen that the structure of this invention provides a drapery curtain manipulator and corresponding apparatus which provides for the manipulation of separate panels of drapes 59 whereby the drapery panels 59 can be urged to a completely closed position; to an interspaced or intermittent open position with selectivity; and to a completely opened position by a single linear drive being selectively and controllably urged in either direction.

This same structure further allows for many variations that are not otherwise accomplishable by drapery hangers presently known. Also, it should be noted that individual panels such as 59*a*, 59*b* and 59*c* can be tied together in varying patterns to create drapery hanger patterns such as indicated (FIGS. 20, 21 and 22), and yet be manipulatable to a fully closed position; selectively intermittent or interspaced adjustable position; or to a fully open position (FIG. 24).

The operation of the second embodiment of the drapery hanger and manipulator of this invention is substantially identical with that above set forth with respect to the first embodiment hereof. Carriers such as 123 (FIG. 5) are substituted for carriers 13 and horizontally positioned track of bridge 121 are substituted to contain the movement of carriers 123 and the corresponding linear drive 124.

It is to be understood that the invention is not to be limited to the specific constructions and arrangements shown and described, as it will be understood to those skilled in the art that certain changes may be made without departing from the principles of the invention.

What is claimed is:

1. A drapery hanger and manipulator for supportably hanging and manipulating one or more drapery curtain panels having a leading and a trailing edge comprising a traverse track bridge to be positioned over an area to be covered by drapery, said bridge having a first track means therealong to slidably support a drapery hook hanger means, said bridge having a second track means therealong to slidably support a drapery carrier means, said bridge having cam means longitudinally spaced apart therealong, drapery hook hanger means slidably supported in said first bridge track for supporting drapery hooks slidably movable along said bridge to support

the drapery panels from the leading to the trailing edge thereof, drapery carriers serially slidably supported in said second bridge track for independent movement along said bridge, said carriers having a hook extension connected to respective selected ones of said series of hook hangers to cause said selected hook hangers to respectively move with said carriers, a linear drive means having forward and reverse drive means for selectively providing forward and reverse linear drive along said bridge, said carriers having forward drive receiving means adapted to sequentially receive forward drive from said linear drive means for respectively moving said panels by urging the leading edge along said bridge in a direction away from the trailing edge thereof, said carriers having reverse drive receiving means disconnectably and respectively receiving said reverse drive means to normally respectively drive said carriers in a reverse direction along said bridge for respectively moving said panels by urging the leading edge along said bridge in a direction away from the trailing edge thereof, a cam follower on one or more of said carriers and responsive to said cam means as said carriers are moved in reverse along said bridge for disconnecting respective reverse drive receiving means to selectively and respectively disconnect the reverse movement of said carriers from said linear drive means, and retainer means longitudinally spaced apart on said bridge respectively and progressively in the linear path of said drapery hook hanger means supporting the respective panel trailing edges to correspondingly retain and position said hook hanger means in groups along said bridge as said carriers are moved along said bridge, whereby said carriers can be driven in the forward direction by said forward drive means to sequentially position drapery curtain panels over a given drapery area, and in the reverse direction by said reverse drive means to individually respectively collapse or withdraw said panels from the given area to provide respective separate light openings for each panel or to selectively completely remove or collapse said panels from the given area.

2. A drapery hanger and manipulator as defined in claim **1** wherein said first traverse bridge track means comprises a T-slot extending longitudinally along the bottom of said bridge, and a bottom surface longitudinally parallel with said slot, and said drapery hook hanger means comprises individual hook hangers having a T-shaped upper portion and lateral side projections in respective complemental sliding relationship with said T-slot and said bottom surface, and a downwardly extending lower portion adapted to accept and retain drapery hooks for supporting draperies.

3. A drapery hanger and manipulator as defined in claim **2** wherein said second traverse bridge track means comprises a key slot extending longitudinally along a side of said bridge, and said drapery carriers being adapted to be slidably keyed into said key slot.

4. A drapery hanger and manipulator as defined in claim **1** wherein said second traverse bridge track means comprises a key slot extending longitudinally along a side of said bridge, and said drapery carriers being adapted to be slidably keyed into said key slot.

5. A drapery hanger and manipulator as defined in claim **1** wherein said traverse track bridge comprises multiple complementally telescoping sections with said first and second track means continuous therethrough.

6. A drapery hanger and manipulator as defined in claim **5** wherein said carrier forward drive receiving means comprises a drive projection located on each of said carriers in the path of said forward drive means and having respectively progressively smaller openings therethrough in the forward direction of movement whereby forward movement of said line through said openings will cause said progressively larger annular projections to sequentially and respectively engage said drive projections at the openings thereof to similarly sequentially and respectively drive said carriers.

7. A drapery hanger and manipulator as defined in claim **5** wherein said carrier reverse drive receiving means comprises a series of forked projections respectively pivotally mounted on said carriers to be pivotally movable to position the tines thereof into the path of said annular lateral line projections, said forked projections being normally biased away from said engagement with said annular line projections.

8. A drapery hanger and manipulator as defined in claim **1** wherein said linear drive means comprises a continuous loop of line axially movably mounted to said bridge with two sections thereof positioned to move parallelly and longitudinally within said bridge in opposite directions, and said forward and reverse drive means being a series of annular lateral projections for each line section, and said annular lateral projections of each series being progressively larger in the forward movement direction of said line and being selectively spaced apart along said section.

9. A drapery hanger and manipulator as defined in claim **1** wherein said carrier forward drive receiving means comprises a drive projection located on each of said carriers in the path of said forward drive means and having respectively progressively smaller openings therethrough in the forward direction of movement whereby forward movement of said line through said openings will cause said progressively larger annular projections to sequentially and respectively engage said drive projections at the openings thereof to similarly sequentially and respectively drive said carriers.

10. A drapery hanger and manipulator as defined in claim **1** wherein said carrier reverse drive receiving means comprises a series of forked projections respectively pivotally mounted on said carriers to be pivotally movable to position the tines thereof into the path of said annular lateral line projections, said forked projections being normally biased away from said engagement with said annular line projections.

11. A drapery hanger and manipulator as defined in claim **1** wherein said second traverse bridge track means comprises a key slot extending longitudinally along a side of said bridge, and said drapery carriers being adapted to be slidably keyed into said key slot, said linear drive means comprises a continuous loop axially movably mounted to said bridge with two sections thereof positioned to move parallelly and longitudinally within said bridge in opposite directions, and said forward and reverse drive means being a series of annular lateral projections for each line section, and said annular lateral projections of each series being progressively larger in the forward movement direction of said line and being spaced apart along said section, said carrier reverse drive receiving means comprises a series of forked projections respectively pivotally mounted on said carriers to be pivotally movable to position the tines thereof into the path of said annular lateral line projections, and said forked projections being normally biased away from said engagement with said annular line projections.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,240,489

DATED : December 23, 1980

INVENTOR(S) : Harold L. Madsen

It is certified that error appears in the above—identified patent and that said Letters Patent is hereby corrected as shown below:

Column 14, line 52, after "loop" insert -- of line --.

Signed and Sealed this

Ninth Day of June 1981

[SEAL]

Attest:

RENE D. TEGTMEYER

Attesting Officer

Acting Commissioner of Patents and Trademarks